

REMARKS

Claims 1, 60-67, 69-71, 78-79, 81 and 83-92 are pending in the present application, of which claims 60-67, 79 and 81 are withdrawn.

Issues under 35 USC 112

Claims 56 and 78 have been rejected under 35 USC 112, first paragraph as allegedly failing to comply with the written description requirement.

Claim 56 has been rejected under 35 USC 112, second paragraph as allegedly being indefinite.

Claim 56 has been cancelled. Claim 78 has been amended. Accordingly, these rejections are moot.

Issues under 35 USC 103(a)

Claims 1, 69-71 and 78 have been rejected under 35 USC 103(a) as being unpatentable over Komatsu '013 (JP 08-283013).

Claims 1, 69-71 and 78 have been rejected under 35 USC 103(a) as being unpatentable over Komatsu '013 in view of Sheen '972 (US 5,474,972).

Claims 55-59 and 78 have been rejected under 35 USC 103(a) as being unpatentable over Komatsu '013 and Sheen '972 in view of Samad.

These rejections are traversed based on the reasons below.

The presently pending claims are directed to a process of producing transition metal silicates, wherein the process being followed imparts microbicidal activity to the transition metal silicate thus produced. Applicant has observed that imparting a particular type of activity and more particularly, imparting microbicidal activity to the transition metal silicate thus being produced in the aforesaid manner has never been attempted in the prior art.

In all of the prior art teachings, the microbicidal activity of a particular type of transition metal silicate is attributed to the nature of transition metal present in the transition metal silicate. Applicant has observed that microbicidal activity exhibited by a particular transition metal silicate is not merely attributed to the nature of transition metal thus present. The process being followed could also impart microbicidal activity to the transition metal silicate thus produced. The above observation assists in imparting microbicidal activity to a transition metal silicate having any one of copper, zinc, manganese, silver and zirconium as the transition metal.

Although, the currently pending claims have been restricted in response to the restrictions actions issued, the Examiner can observe that Applicant has successfully imparted microbicidal activity in transition metal silicates which contain varied types of transition metal such as copper, zinc, manganese, silver and zirconium.

With regard to cupric silicates (to which the presently pending claims are restricted because of restriction action issued by the Examiner previously), Applicant has further observed that it is possible to selectively impart microbicidal activity to cupric silicates by controlling the ratio between silicate and copper in the final product (cupric silicate), meaning thereby that by controlling the ratio between silicate and copper in the final product, it is possible to selectively impart microbicidal activity to the cupric silicate. Applicant has demonstrated that it is now possible to selectively impart microbicidal activity to cupric silicates by maintaining silica to copper ratio in the range of 1:0.34 to 1:5.15.

Although, cupric silicate complexes are available having silica to copper ratio beyond what has been defined in claim 1, Applicant has observed that it is very difficult in an industrial process to impart biological activity in cupric silicates having silica to copper ratio beyond what has been defined in claim 1. More particularly, Applicant has observed that it is difficult in an industrial process to impart microbicidal activity in cupric silicates having silica to copper ratio beyond what has been defined in claim 1. Thus, as a first step, Applicant has determined that by maintaining silica to copper ratio of cupric silicates in the range of 1:0.34 to 1:5.15, it is possible to impart microbicidal activity in the same.

Applicant has further observed that the ratio between silica and copper in the final product (cupric silicate) could be controlled by controlling:

- (a) the amounts of silicate and metal present in the starting materials which are used for preparing the cupric silicate; and
- (b) controlling the process by which the cupric silicate is formed.

Although the Examiner may be of the opinion that (a) is a well established fact, the surprising factor which a person skilled in the art would not contemplate is that by modifying one or more of the factors which fall under the category of process conditions, it is possible to obtain directly influence the ratio between silica and copper in the final product.

In this regard, the following two scenarios arise out of the above observation of Applicant:

- (a) starting materials of two different types (i.e. starting materials wherein the amounts of silicate and metal present is different) can yield cupric silicate final product having same / similar ratio of silicate and copper based on the manner in which the process is controlled; and
- (b) starting materials of same type (i.e. starting materials wherein the amount of silicate and metal present is same) can yield cupric silicate final product having different ratio of silicate and copper based on the manner in which the process is controlled.

The aforesaid scenarios would not have been obvious to a person of ordinary skill in the art. Applicant has observed the same in the present case and has also demonstrated the same. Particularly, when we compare examples 2, 5 and 6, it is evident that starting materials of same type (i.e. starting materials wherein the amount of silicate and metal present is same) can yield cupric silicate final product having different ratio of silicate and copper based on the manner in which the process is controlled. Similarly, upon comparing examples 2 and 4, it is evident that starting materials of two different types (i.e. starting materials wherein the amounts of silicate

and metal present is different) can yield cupric silicate final product having same / similar ratio of silicate and copper based on the manner in which the process is controlled.

As noted above, the claims are directed towards arriving at process of producing transition metal silicates wherein the process being followed imparts microbicidal activity to the transition metal silicate thus produced.

In all prior art documents, the approach has been to arrive at a process which produces cupric silicate having a particular ratio of silicate and copper and attributing the property thus exhibited by the copper silicate as inherent to the ratio of silicate and copper. The subject application deviates totally in principle from the set theory of a fixed ratio having a predetermined property. It is conceptualized and claimed in the subject application that the property is not necessarily inherent to the ratio of the transition metal silicate complex. Hence it is now possible to impart microbicidal activity to copper silicate having a particular ratio of silicate and copper, which was previously not considered to be active, by controlling the process parameters.

More particularly, Applicant notes that prior art documents in this field have always taught that cupric silicates having identical / similar ratio of silicate and copper, would have identical properties. In contrast, the present application completely differs from the above findings of the prior art in the sense that cupric silicate having identical / similar ratios of silicate and copper can exhibit different properties altogether and more particularly, degrees of microbicidal activity. This can be easily illustrated from an example drawn from the specification of the subject application.

For instance, Examples 2 and 4 of the specification are drawn to copper silicates, wherein the ratio of the silicate to copper is 1:0.78 and 1:0.83 (very similar) but differ widely in properties. The copper silicate (1:0.78) of Example 2 decontaminated arsenic up to 55.8% and disinfected 2.72×10^5 colioform bacteria completely. On the other hand, the copper silicate of Example 2 (1:0.83) decontaminated arsenic only up to 8% and disinfected only 21.69% of the

colioform bacteria. Similarly, other examples elaborate and support the said concept. A summary of the differing process parameters in the synthesis resulting in varied functional aspects can be found at Tables 1 and 2.

Thus, Applicant has observed and is claiming that it is possible to directly influence the ability of cupric silicates to impart microbicidal activity by controlling:

- (c) the amounts of silicate and metal present in the final product; and
- (d) controlling the process by which the cupric silicate is formed.

The concept of being able to directly influence the ability of cupric silicates to impart microbicidal activity by controlling the amounts of silicate and metal present in the final product has been illustrated with Examples in the specification. The Examiner's attention is directed to the examples disclosed at Tables 3 and 6 at page 68 and 71. As per these tables, the cupric silicates having the ratio 1:5.15 exhibits excellent bactericidal, fungicidal property of cupric silicates against *E.coli*, *Scelerotium rolfsii*, *Rhizoctonia solani*, *Fusarium oxysporum* and *Pyricularie oryzae*. At Table 6, it can however be noted that cupric silicate synthesized at neutral pH conditions and having 1:0.78 ratio exhibits comparatively less fungicidal activity against the above mentioned fungi to the ratio of 1:5.15.

Similarly, the concept of being able to directly influence the ability of cupric silicates to impart microbicidal activity by controlling the process by which the cupric silicate is formed has been illustrated with Examples in the specification. Such varying degree of functional aspects is obtained by just varying the reaction conditions, such as pH, reactant concentrations and temperature. (See page 4, line 28 of PCT to page 5 line 5).

The originally filed claims were not restricted to any particular type of activity, and read as:

- (a) adding a solution of the transition metal to a soluble alkali solution to form a mixture
- (b) adjusting pH and/or temperature of the mixture;
- (c) forming a precipitate comprising the transition metal silicate;

(d) washing and drying the precipitate to obtain the transition metal silicate

Applicant has restricted the claims and is merely claiming the manner in which the process of producing the cupric silicate is needed to be controlled so as to impart microbicidal activity in the cupric silicate thus produced.

As amended, the claims require:

- (i) adding a transition metal salt solution to a soluble alkali silicate solution under acidic conditions to form a mixture;
- (ii) forming a precipitate of a transition metal silicate, and
- (iii) washing and drying the precipitate thus formed to obtain the transition metal silicate; thus defining the manner in which the process of producing the cupric silicate is needed to be controlled so as to impart microbicidal activity in the cupric silicate thus produced.

The Examiner argues that the invention of the subject application is not novel and inventive over the following prior art documents:

- Komatsu et al (JP09283013) and
- Sheen et al (US 5474972).

The prior art, namely JP'013, and US '972 only disclose certain processes for the synthesis of metal silicate and the resultant activity. The prior art documents do not teach or suggest the concept of being able to directly influence the ability of cupric silicates to impart a particular type of activity by controlling the process by which the cupric silicate is formed. As the aforesaid concept itself is not taught in said documents, Applicant submits that the above documents also do not indicate that for the purpose of imparting microbicidal activity in cupric silicate, it is needed to control the process so as to have the particular steps as defined in claim 1.

Reconsideration and withdrawal of all rejections of record are respectfully requested.

If any questions arise in the above matters, please contact Applicant's representative, Richard Gallagher (Reg. No. 28,781), in the Washington Metropolitan Area at the phone number listed below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

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